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THE ECLIPSE GROUP LLP
10605 BALBOA BLVD., SUITE 300
GRANADA HILLS, CA 91344

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DABNEY, PHYLESHA LARVINIA	
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte BERNARD M. WERNER

Appeal 2009-003277
Application 10/046,404
Technology Center 2600

Decided: August 20, 2009

Before KENNETH W. HAIRSTON, JOHN C. MARTIN, and
BRADLEY W. BAUMEISTER, *Administrative Patent Judges*.

BAUMEISTER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant appeals under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1-8 and 11-28 as being anticipated by U.S. Patent 3,930,561, issued to Klayman on January 6, 1976. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

We reverse the rejections of record. We enter new grounds of rejection as to pending claims 1-8 and 11-28 pursuant to our authority under 37 C.F.R. § 41.50(b).

A. Appellant's invention

Appellant's invention relates to loudspeaker horns having a small end (or "throat"), a larger end (or "mouth") that radiates sound, and a portion between the mouth and throat through which sound travels. "The portion between the throat and mouth includes an inner surface, referred to as an 'acoustic waveguide.'" App. Br. 5 (filed July 26, 2007). The shape of the acoustic waveguide's surface "constrain[s] and control[s] the radiation of acoustic energy" towards the mouth. Spec. 1.

An acoustic waveguide's surface includes "control curves": two-dimensional curves along the waveguide's surface that extend from the horn's throat to mouth, identified by axially bisecting the waveguide with an imaginary plane. That is, vertically bisecting the waveguide from throat to mouth identifies top and bottom control curves of the waveguide surface. Likewise, horizontally bisecting the waveguide identifies right and left control curves. Spec. 4-11; figs. 1-5.

The term "energy-surface" relates to the degree of curvature possessed by the waveguide surface. Spec 7. For example, dents,

protrusions, and edges in the waveguide increase the waveguide's surface energy. Spec. 7. Mathematical discontinuities in the control curves (local discontinuities in the curves' rate of curvature) also increase the surface energy. Spec. 7. As such, the surface energy affects the radiation of acoustic energy through the waveguide. Spec. 1.

Appellant's invention, then, relates to a waveguide surface that extends from a circular throat to a non-elliptical mouth,[1] the waveguide having a "least-energy-surface." Restated, the inventive waveguide has specially shaped top, bottom, left, and right control surfaces, and further has an inner surface passing through the control curves in a configuration that minimizes the waveguide's total surface energy. Spec. 4-5; Abstract.

B. The claims

Illustrative claim 1 is reproduced below, with the language at issue in italics:

1. An acoustic waveguide, comprising:
a first control curve;
a second control curve;
a third control curve;
a fourth control curve; and
a *continuous three-dimensional least-energy-surface* coincident with the first control curve, the second control curve, the third control curve and the fourth control curve that intersect a circular throat end and a non-elliptical closed control surface that defines a mouth.

(emphasis added).

[1] The Specification defines a circle to be a species of an ellipse. Spec. 4. As such, the non-elliptical mouth may not be circular in shape either.

ISSUE

The issue before us is whether one of ordinary skill could reasonably determine the metes and bounds of the claims, which include the claim language "least-energy-surface."

FINDINGS OF FACT

The record supports the following Findings of Fact (FF) by a preponderance of the evidence:

Appellant's Specification

1. A least-energy-surface may be a surface that passes through the specified controlling geometry in a manner that provides the minimum change in curvature when the rate of change of local curvature change is integrated in the mathematical sense (summed) over the entire surface. Alternately, the least-energy-surface may be mathematically one of the simplest equations representing the surface. Typically, this may be represented by the lowest order polynomial, or the factored expression with the least number of poles and zeros that causes a surface to go through the curves. The least-energy-surface in acoustic waveguide 100 is defined by the upper vertical, lower vertical, left horizontal, and right horizontal control curves 106, 108, 110 and 112 in addition to the circular throat 102 and the closed control curve of the mouth 104.

Spec. 7.

2. "The control curves rest in the horizontal and vertical planes and may also be free of any discontinuities, i.e. they may be continuous curves." Spec. 6.

3. "Optimally, the minimization of mathematical discontinuities that may appear as discontinuous edges, protrusions or steps located on the inner surface of the acoustic waveguide 100 is sought." Spec. 7.

4. "The acoustic waveguide surface may be made of a single continuous piece of material or from multiple peaces of materials [sic: pieces of material] that function as a continuous surface with minimal discontinuities after assembly." Spec. 9.

PRINCIPLES OF LAW

> 35 U.S.C. § 112, ¶ 2 requires that the specification of a patent "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." Because claims delineate the patentee's right to exclude, the patent statute requires that the scope of the claims be sufficiently definite to inform the public of the bounds of the protected invention, i.e., what subject matter is covered by the exclusive rights of the patent. Otherwise, competitors cannot avoid infringement, defeating the public notice function of patent claims. ("[T]he primary purpose of the requirement is 'to guard against unreasonable advantages to the patentee and disadvantages to others arising from uncertainty as to their [respective] rights.'") The Supreme Court has stated that "[t]he statutory requirement of particularity and distinctness in claims is met only when [the claims] clearly distinguish what is claimed from what went before in the art and clearly circumscribe what is foreclosed from future enterprise."

Halliburton Energy Servs., Inc. v. M-I LLC, 514 F.3d 1244, 1249 (Fed. Cir. 2008) (internal citations omitted).

> [T]he patent drafter is in the best position to resolve the ambiguity in the patent claims, and it is highly desirable that patent examiners demand that applicants do so in appropriate circumstances so that the patent can be amended during prosecution rather than attempting to resolve the ambiguity in litigation.

Id. at 1255.

"[I]f a claim is amenable to two or more plausible claim constructions, the USPTO is justified in requiring the applicant to more precisely define the metes and bounds of the claimed invention by holding the claim unpatentable under 35 U.S.C. § 112, second paragraph, as indefinite." *Ex parte Miyazaki*, 89 USPQ2d 1207, 1211 (BPAI 2008).

ANALYSIS

"Before considering the rejections . . . , we must first [determine the scope of] the claims . . . ." *In re Geerdes*, 491 F.2d 1260, 1262 (CCPA 1974). We must therefore initially determine the meaning of the claim term "least-energy-surface," which is present in each of independent claims 1, 7, and 12-14. We conclude that the meaning of the term "least-energy-surface" is not sufficiently clear to enable a person of ordinary skill in the art to determine the metes and bounds of the appealed claims.

Appellant's Specification states that "[t]he least-energy-surface in acoustic waveguide 100 is defined by the upper vertical, lower vertical, left horizontal, and right horizontal control curves 106, 108, 110 and 112 in addition to the circular throat 102 and the closed control curve of the mouth 104." FF 1. The Specification does not provide any express definition for what constitutes a least-energy-surface, though. Rather, it merely recites *examples* of what may constitute a least-energy-surface:

> [(1)] A least-energy-surface *may be* a surface that passes through the specified controlling geometry in a manner that provides the minimum change in curvature when the rate of change of local curvature change is integrated in the mathematical sense (summed) over the entire surface. [(2)] *Alternately*, the least-energy-surface *may be* mathematically one of the simplest equations representing the surface.

> *Typically*, this *may be* represented by the lowest order polynomial, or the factored expression with the least number of poles and zeros that causes a surface to go through the curves.

FF 1 (emphasis added).

The first example explains that a least-energy-surface may be a surface passing through the control curves in a configuration such that the truly minimal change in curvature is achieved. However, the second example indicates that other surfaces, not possessing the truly minimal energy, may also be deemed to be a least-energy-surface so long as they merely satisfy any of the variously recited mathematical approximations of a true least-energy-surface.

The presence of conflicting examples is problematic. It is completely foreseeable that a candidate waveguide surface configuration does not possess the truly minimal energy achievable, but does satisfy one of the least-energy-surface criteria for one or more of the stated mathematical approximations. In such a case, it would not be reasonably clear whether the particular waveguide configuration would constitute a "least-energy-surface" waveguide within the meaning of the claim. That is, it would not be reasonably clear whether such a waveguide would infringe upon the present claims.

Even more problematic is the fact that the Specification does not even provide any objective standard for reasonably determining which representative mathematical equations would constitute an approximation of a least-energy-surface that is within the meaning of the claim. Rather, by stating that "[*t*]*ypically*, this [approximation] *may be* represented by the lowest order polynomial, or the factored expression with the least number of poles and zeros that causes a surface to go through the curves" (FF 1

(emphasis added)), the Specification indicates that other mathematical approximations, which are not disclosed by the Specification, may be used. As such, even if one were to interpret the claim language broadly as covering both (1) truly minimal least-energy-surfaces and also (2) mere approximations of a least-energy-surface, one would still not be put on reasonable notice of which approximations are intended to be included within, or alternatively excluded from, the scope of the claims.

Various claims on appeal also raise an additional question regarding the intended meaning of the claim term "least-energy-surface." For example, independent claims 1 and 12-14 more specifically recite "a *continuous* three-dimensional least-energy-surface" (emphasis added). This claim language is in contrast with that of independent claim 7, which merely recites, "generating a least-energy-surface"—*not* a *continuous* least-energy-surface. In contrast, claim 2 recites, "wherein the continuous three-dimensional least-energy-surface [of claim 1] is free of discontinuities." Moreover, claim 8 recites, "where generating [the least-energy-surface of claim 7] further comprises forming the least-energy-surface as a continuous surface *minimizing*[2] the formation of any discontinuities" (emphasis added).

The differences in the present claims' language beg the question: What is the difference between "a least-energy-surface" (claim 7); a "least-energy-surface [formed] as a continuous surface minimizing the formation of any discontinuities" (claim 8); "a continuous . . . least-energy-surface" (claim 1); and a "continuous . . . least-energy-surface . . . free of

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[2] By employing the relative term "minimizing," dependent claim 8 does not necessarily require that the waveguide surface be *completely free* of discontinuities.

discontinuities (claim 2)? Restated, what additional subject matter is covered by a claim that merely recites "a least-energy-surface" without further limiting that surface to also being "continuous" and/or "minimizing . . . discontinuities"?

The Specification does state that "[t]he control curves rest in the horizontal and vertical planes and may also be free of any discontinuities, i.e. they may be continuous curves." FF 2. As such, the term "continuous" might mean "free of any discontinuities." However, this definition is used specifically for the two-dimensional control curves, not for the entire three-dimensional waveguide surface. Also, the Specification further states, "[o]ptimally, the *minimization of mathematical discontinuities* that may appear as discontinuous edges, protrusion or steps located on the inner surface of the acoustic waveguide 100 is sought [by the present invention]." FF 3 (emphasis added). As such, a continuous waveguide surface might be one in which the discontinuities are merely "minimized," but not necessarily eliminated.

But the Specification also states, "[t]he acoustic waveguide surface may be made of a single continuous piece of material or from multiple peaces of materials [sic: pieces of material] that function as a continuous surface with minimal discontinuities after assembly." FF 4. Reading the Specification as a whole, then, it might be the case that a "least-energy-surface" is a waveguide surface that generally has "minimal" discontinuities; a "continuous . . . least-energy-surface" is one that has no discontinuities in the control curves, but may have "minimal" discontinuities in other portions (e.g., the boundaries between the top, sides, and bottom) of the waveguide surface; and a "continuous . . . least-energy-surface . . . free of

discontinuities" might be one that has no discontinuities either in the regions of the control curves or in the corners. Alternatively though, a "continuous . . . least-energy-surface . . . free of discontinuities" may be a surface that has "minimal" discontinuities at the multiple materials' boundaries. Suffice it to say, though, any interpretation applied to the noted terms would be purely speculative at best.

To summarize, independent claims 1 and 12-14 each recite an acoustic waveguide comprising, *inter alia*, a "least-energy-surface." Independent claim 7 similarly recites a method for creation of an acoustic waveguide, comprising, *inter alia*, a "least-energy-surface." Based upon Appellant's Specification and claims, one of ordinary skill in the art would not be reasonably apprised of whether the subject matter covered by the claims is limited to waveguides having no discontinuities, or alternatively whether the claimed subject matter also covers waveguides having "minimal" discontinuities. Also, assuming for the sake of argument that the broader subject matter is also included within the claims' scope, such an artisan would also not be reasonably apprised of just how many discontinuities constitute "minimal" discontinuities. Furthermore, and irrespective of whether a least-energy-surface may include any discontinuities, the claims also do not reasonably apprise such an artisan whether the term "least-energy-surface" narrowly covers only those waveguide configurations that possess the least energy possibly achievable, or alternatively whether the claim term additionally covers configurations that merely approximate a least-energy-surface. Assuming again for the sake of argument that the term "least-energy-surface" also covers the broader subject matter (configurations that merely approximate a least-

energy-surface), the artisan would likewise not know which approximations are within the scope of the claim language.

For these reasons, the scope of claims 1, 7, and 12-14 is not sufficiently definite to inform the public of the bounds of the protected invention, i.e., what subject matter is covered by the exclusive rights of the patent. Accordingly, we find that the ambiguities render claims 1, 7, and 12-14 indefinite under 35 U.S.C. § 112, ¶ 2. We likewise find dependent claims 2-6, 8, 11, and 15-28 to be indefinite as well.

PRIOR ART REJECTION OF CLAIMS 1-8 AND 11-28

For the reasons expressed in this opinion, claims 1-8 and 11-28 are indefinite. Therefore, the prior art rejections must fall, *pro forma*, because they necessarily are based on speculative assumption as to the meaning of the claims. *See In re Steele*, 305 F.2d 859, 862-63 (CCPA 1962). It should be understood, however, that our decision to reverse the Examiner's prior art rejections of claims 1-8 and 11-28 is based solely on the indefiniteness of the claimed subject matter and does not reflect on the adequacy of the prior art evidence applied in support of the rejection of these claims.

CONCLUSION OF LAW

One of ordinary skill in the art could not reasonably determine the metes and bounds of the appealed claims due to the claim language "least-energy-surface." Accordingly, the language of independent claims 1, 7, and 12-14, "least-energy-surface," renders claims 1-8 and 11-28 indefinite under 35 U.S.C. § 112 ¶ 2.

DECISION

(1) We do not sustain the Examiner's rejection with respect to all pending claims on appeal. Therefore, the Examiner's decision rejecting claims 1-8 and 11-28 is reversed.

(2) We reject claims 1-8 and 11-28 under 35 U.S.C. § 112 ¶ 2 as being indefinite.

(3) Since we have entered a new ground of rejection, our decision is not a final agency action.

FINALITY OF DECISION

This decision contains new grounds of rejection pursuant to 37 C.F.R. § 41.50(b). This regulation states "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review." Furthermore 37 C.F.R. § 41.50(b) also provides that Appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new grounds of rejection to avoid termination of the appeal as to the rejected claims:

> (1) *Reopen prosecution*. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .
>
> (2) *Request rehearing*. Request that the proceeding be reheard under § 41.52 by the Board upon the same record.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

REVERSED
37 C.F.R. § 41.50(b)

babc

THE ECLIPSE GROUP LLP
10605 BALBOA BLVD., SUITE 300
GRANADA HILLS, CA 91344